ARTICLES SEPARATING
AND SUPPLYING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an articles separating and supplying apparatus and method by which articles of a predetermined number to be packaged are separated and differently positioned to be supplied to a subsequent packaging process.

Description of the Prior Art

In a packaging machine, in case where a plurality of articles to be packaged are arrayed in rows, each row having a predetermined number of the articles, the articles are first separated into each row having the articles of the predetermined number and then the rows of a predetermined number are fed into a box or container to be packaged in one or more stages.

In a prior art packaging method in which such a plurality of articles are arrayed being separated into each row having a predetermined number of the articles, it is customary to use an automatic separating apparatus that is called a channelizer obtainable on the market.

This automatic separating apparatus called the channelizer is constructed such that there is provided a plate member that is called a plank forming a transfer conveyor for transferring the articles and this plate member is laterally shifted along a separating guide. However, the structure of this apparatus is complicated and expensive.

Also, in the prior art separating apparatus, it is usual that the number of the articles to be separated is counted by a counter and, upon the counter counting a predetermined number of the articles, feeding-in of the articles is stopped and then an automatic separating apparatus is operated to separate and supply the counted articles of the predetermined number. For this reason, counting of the articles to be next separated is started only after the separation of the first counted articles and hence there is a problem that the separation takes time.

Also, for a structural reason of the prior art separating apparatus, on each time when the articles to be handled are changed, the arrangement position of the counter must be changed and adjusted or the fitting position of a stopper for stopping feeding-in of the articles must be changed and adjusted and this requires a complicated and time-consuming work.

SUMMARY OF THE INVENTION

In view of the abovementioned problems in the prior art articles separating and supplying apparatus, it is an object of the present invention to provide an articles separating and supplying apparatus by which articles of a predetermined number to be packaged are separated and differently positioned to be supplied to a subsequent packaging process and in which, by a simplified structure and facilitated adjustment of the apparatus, the separation and supply of the articles of the predetermined number can be securely carried out even in case of a size change of the articles.

Also, it is an object of the present invention to provide an articles separating and supplying apparatus in which articles of a predetermined

number to be packaged can be separated and supplied at a high speed.

Further, it is an object of the present invention to provide an articles separating and supplying method by use of the apparatus mentioned above.

In order to solve the mentioned objects, the present invention provides an articles separating and supplying apparatus comprising; a transfer conveyor transferring articles arrayed to be separated and supplied, a separating conveyor having its one end portion arranged to receive the articles to be separated transferred by the transfer conveyor, the separating conveyor being supported pivotably around the one end portion as a pivotal center, a counter counting the number of the articles received by the separating conveyor, a first stopper stopping feeding-in of the articles transferred by the transfer conveyor, as soon as the counter counts a predetermined number of the articles, and a second stopper being arranged so as to stop at a stop position that is a position of a front one of the articles of the predetermined number on the separating conveyor to thereby stop feeding-out of the articles from the separating conveyor, the second stopper having the stop position constructed changeable.

According to the articles separating and supplying apparatus of the present invention constructed as mentioned above, as soon as the articles of the predetermined number to be separated are received after the second stopper, the separating conveyor that has received the articles of the predetermined number to be separated is rotated to swing to a direction of separation, in which the articles are to be separated and supplied, around the articles receiving end portion as the pivotal center of the separating conveyor. Then, the articles of the predetermined number received after the

second stopper are fed out to the direction of separation. Thus, the separation and supply of the articles can be done so as to be easily packaged.

Moreover, according to the articles separating and supplying apparatus of the present invention, the counter is provided to count the number of the articles transferred by the transfer conveyor and the second stopper is arranged to stop at the stop position, that is, the position of the front one of the articles of the predetermined number on the separating conveyor. Hence, the articles of the predetermined number to be separated can be securely and correctly stored after the second stopper.

Also, according to the articles separating and supplying apparatus of the present invention, the stop position of the second stopper as the position of the front one of the articles of the predetermined number on the separating conveyor is constructed changeable. Thus, even if the size of the articles to be separated or the number of the articles to be separated is changed, the stop position of the second stopper can be easily adjusted and thereby the articles of the predetermined number can be securely received onto the separating conveyor.

In the articles separating and supplying apparatus of the present invention, the operation thereof can be done by the steps of; causing the first stopper to stop feeding-in of the articles transferred by the transfer conveyor, as soon as the articles of the predetermined number are conveyed after the second stopper, and releasing the second stopper so that the articles of the predetermined number after the second stopper are fed out to a place of separation by the separating conveyor, as well as releasing the first stopper

so that the articles of the predetermined number are fed in after the second stopper by the transfer conveyor. Thereby, the separation of the articles on the separating conveyor as well as the receiving of the articles of the predetermined number to be separated onto the separating conveyor can be done substantially at the same time and the supply of the articles of the predetermined number from the separating conveyor can be securely done.

In the articles separating and supplying apparatus of the present invention, if the second stopper comprises an endless belt and a stopper member projecting from the endless belt and the second stopper has the stop position constructed changeable by movement of the endless belt, then the stop position of the second stopper can be easily adjusted to the position of the front one of the articles of the predetermined number received on the separating conveyor.

Also, in the above apparatus in which the second stopper comprises the endless belt and the stopper member projecting from the endless belt, if a plurality of the stopper members are arranged with an interval being maintained between each of them along a running direction of the endless belt and also if the plurality of stopper members are constructed so that, while the articles of the predetermined number to be separated that have been stopped after one of the plurality of stopper members are being fed out to be separated, another one of the plurality of stopper members receives a front one of the articles of the predetermined number to be next separated and moves to the stop position of the second stopper to stop there, then the operation of separation of the articles of the predetermined number and the operation of receiving the articles to be next separated can be done

substantially at the same time and the speed of separation of the articles can be enhanced.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an entire construction of an articles separating and supplying apparatus of an embodiment according to the present invention and comprises Figs. 1(a) and 1(b), wherein Fig. 1(a) is a side view thereof and Fig. 1(b) is a side view showing a conveyor portion thereof only.

Fig. 2 is a plan view of a transfer conveyor 1 and a separating conveyor 10 of the apparatus of Fig. 1.

Fig. 3 is a side view showing a construction of a second stopper 18 of the apparatus of Fig. 1 and comprises Figs. 3(a) and 3(b), wherein Fig. 3(a) shows a state where each four of packaged articles are separated and Fig. 3(b) shows a state where each three of two consecutively packaged articles are separated.

Fig. 4 is a side view same as Fig. 3(a) showing an operating state of the second stopper 18 of Fig. 3 and comprises Figs. 4(a) and 4(b), wherein Fig. 4(a) shows a position of an engaging member of the second stopper while the second stopper is being operated and Fig. 4(b) shows a state where the engaging member is moved to a position near a front position of the articles of a predetermined number on the separating conveyor.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Herebelow, the present invention will be described more concretely based on an embodiment of an articles separating and supplying apparatus

according to the present invention with reference to the appended drawings.

(Entire Construction)

An entire construction of the articles separating and supplying apparatus will be first described with reference to Fig. 1. In Fig. 1 comprising Figs. 1(a) and 1(b), numeral 1 designates a transfer conveyor that transfers articles to be separated and supplied, wherein the articles are arrayed in one row and placed on the transfer conveyor 1. The transfer conveyor 1 comprises two endless belt members 4 that are wound around pulleys 2, 3 for transferring the articles. The two endless belt members 4 are arranged in parallel with each other with a space being maintained between them. The transfer conveyor 1 has its inlet end side supported by a frame 5 and outlet end side supported by a supporting body 6.

Numeral 10 designates a separating conveyor that receives the articles transferred in the row by the transfer conveyor. The separating conveyor 10 has its articles receiving end side supported by the supporting body 6, wherein an articles receiving end portion of the separating conveyor 10 and an outlet end portion of the transfer conveyor 1 are arranged so as to butt with each other.

The separating conveyor 10 comprises two endless belt members 14 that are wound around pulleys 12, 13 for conveying the articles. The two endless belt members 14 are arranged in parallel with each other with a space being maintained between them. The separating conveyor 10 is provided to rotate swingably by an angle needed for each of the separations of the articles in a horizontal plane around a pivot 11 that is provided in or below the outlet end portion of the transfer conveyor 1.

The swinging rotation of the separating conveyor 10 around the pivot 11 is effected by the construction in which an outlet end portion of the separating conveyor 10 (the left hand side in the figure) is placed slidably on a slide member 15 provided on a frame 19 so that the separating conveyor 10 is rotated to swing around the pivot 11 by a drive of an air cylinder 16. The separating conveyor 10 is rotated by an angle needed for each of the separations of the articles.

Numeral 17 designates a first stopper provided in the middle portion of the separating conveyor 10. The first stopper 17 may be of an arbitrary structure if it engages with the articles transferred by the transfer conveyor 1 to stop their movement and description in detail thereof will be omitted.

At a position of the outlet end portion of the separating conveyor 10, a second stopper 18 is arranged in the space between the two belt members 14 arranged in parallel with each other to form the separating conveyor 10. The second stopper 18 is a device to abut on a front one of the articles conveyed on the belt members 14 of the separating conveyor 10 to stop feeding-out thereof from the separating conveyor 10. Construction of the second stopper 18 will be described later.

Numeral 26 designates a counter that counts the number of the articles conveyed on the separating conveyor 10. Upon counting a predetermined number of the articles, the counter puts out an operating signal to the first stopper 17.

With respect to the articles separating and supplying apparatus constructed as illustrated and described above, the construction of the transfer conveyor 1, separating conveyor 10 and second stopper 18 will be

described next.

(The transfer conveyor 1)

The transfer conveyor 1, as described with respect to Fig. 1, comprises the two endless belt members 4 arranged in parallel with each other. The two endless belt members 4 are shown by reference numerals 4-1 and 4-2 in Fig. 2.

The transfer conveyor 1 is a device that transfers the articles to be separated, wherein the articles to be separated are arrayed in one row. The construction of the transfer conveyor 1 is not limited to the one having the two endless belt members as illustrated.

The articles to be transferred by the transfer conveyor 1 are packaged articles, for example, supplied from a packaging apparatus etc. of an upstream process but, needless to mention, there is no limitation in the articles to be handled.

Also, while the transfer conveyor 1 as illustrated has been described as the one to transfer the articles arrayed in one row, the transfer conveyor 1 may be such one as transfers the articles arrayed in a plurality of rows.

(The separating conveyor 10)

Next, the separating conveyor 10 will be described. The separating conveyor 10, as described in the above item of the Entire Construction, comprises the two endless belt members 14 arranged in parallel with each other and wound around the pulleys 12, 13 with a space being maintained between the two endless belt members 14. The two endless belt members 14 are shown by reference numerals 14-1 and 14-2 in Fig. 2.

The separating conveyor 10 has its one end arranged so as to butt

with the outlet end portion of the transfer conveyor 1, as described with respect to Fig. 1, and this butting end portion of the separating conveyor 10 is provided to be rotated swingably around the pivot 11. The outlet end portion of the separating conveyor 10 is rotatable by an angle needed for each of the separations of the articles. An example of the mode of the rotation is shown in Fig. 2 by an arc of chain line and by front views of the separating conveyor 10 at three separation positions on the left end side of Fig. 2.

The first stopper 17, as described before, is provided in the middle portion of the separating conveyor 10 so as to function to stop the movement of the articles conveyed on the belt members 14-1, 14-2 of the separating conveyor 10. Also, as described before, the second stopper 18 is provided on the downstream side of the first stopper 17. Construction of the second stopper 18 will be described next with reference to Fig. 3.

(The second stopper 18)

In Fig. 3 comprising Figs. 3(a) and 3(b), the second stopper 18 comprises an endless belt 22 that is wound around pulleys 20, 21. This endless belt 22 comprises two engaging members 23, 24 that project from the endless belt 22 and are arranged with an interval being maintained between them in their running direction. The endless belt 22 is arranged between, and in parallel with, the two belt members 14-1, 14-2 forming the separating conveyor 10.

One of the engaging members 23, 24, that is, the engaging member 23 in the example shown in Fig. 3, engages with a front one of the articles A conveyed on the two endless belt members 14-1, 14-2 forming the

separating conveyor 10 to stop the movement thereof. Then, the articles of a predetermined number to be separated are stopped and stored subsequently to and after the front one so stopped. In Fig. 3(a), four of packaged articles are stored after the engaging member 23. In Fig. 3(b), three of two consecutively packaged articles are stored after the engaging member 23. Construction of the device is made such that, when the articles of the predetermined number are so stored after the engaging member 23 provided projecting from the endless belt 22, it is detected by the counter 26 arranged in the middle of the separating conveyor 10. Type and construction of the counter 26 may be appropriately employed from the known art and description in detail thereof will be omitted.

As soon as the counter 26 detects the articles of the predetermined number fed in to be stored after the engaging member 23, the first stopper 17 is operated by an air cylinder 25 so that the first stopper 17 engages with the articles that are being conveyed on the endless belt members 14-1, 14-2 to stop the movement thereof. Thereby, the articles A in excess of the predetermined number are prevented from being conveyed in the direction of the endless belt 22. Bottom surfaces of the articles A of which movement has been so stopped slide on upper surfaces of the running endless belt members 14-1, 14-2.

When the articles A of the predetermined number to be separated are stored on the endless belt members 14-1, 14-2 on the downstream side of the first stopper 17, it is detected by the counter 26 and feeding-in of the articles A in excess thereof is stopped by the first stopper 17, as mentioned above. Then, the endless belt 22 is moved in the direction of arrow B in Fig.

3(a) and the articles A of the predetermined number that have been conveyed on the endless belt members 14-1, 14-2 forming the separating conveyor 10 and have been stopped by the engaging member 23 are thereby conveyed to the direction in which the articles of the predetermined number are placed being separated.

At this time, the endless belt 22 of the separating apparatus shown in Fig. 3(a) is in the state shown in Fig. 4(a), wherein the engaging member 24 is positioned downstream of the first stopper 17 and the articles of the predetermined number stored after the engaging member 23, as mentioned above, are in the process of being separated and, at the same time, the articles A of which movement has been stopped by the first stopper 17 are released to be conveyed toward the engaging member 24. Then, as shown in Fig. 4(b), the endless belt 22 is moved in the direction of arrow B together with the articles A that are being conveyed by the belt members 14-1, 14-2. When the engaging member 24 reaches a stop position of the engaging member 23 shown in Fig. 3, that is a position of the front one of the articles of the predetermined number on the separation conveyor 10, the endless belt 22 is stopped and the articles of the predetermined number to be next separated are stored after the engaging member 24 so stopped.

As soon as the articles A of the predetermined number to be next separated are stored after the engaging member 24, the separating conveyor 10 is rotated to swing by a predetermined angle around the pivot 11, as described with respect to Fig. 2, so that the articles A of the predetermined number are further conveyed to be placed on a separation position different from the previous one.

Thus, the separating conveyor 10 is operated so as to separate the articles such that the articles A of the predetermined number are arrayed in a plurality of rows and, once the articles A arrayed in a predetermined number of the rows are separated, these articles A are fed, as they are, into a box or container for packaging purpose.

In order for the articles A of the predetermined number to be arrayed in a plurality of rows to be fed into a box or container, such a feeding technology as disclosed by the Japanese Laid-open Patent Application Hei 10-264901, for example, may be employed.

According to the articles separating and supplying apparatus of the embodiment as illustrated and described above, the articles A that are being conveyed in a row can be securely separated into the articles A of the predetermined number and these articles A of the predetermined number can be arrayed in a plurality of rows.

While the present invention has been described based on one embodiment, the invention is not limited to this embodiment only but, needless to mention, may be added with various changes and modifications within the scope of the invention as defined by the appended claims.

For example, in the embodiment as illustrated, while the case of the three separation positions has been shown in Fig. 2, the number of the separation positions is not limited thereto but may be an arbitrary number of plurality.

Also, in the embodiment as illustrated, while the rotation of the separating conveyor 10 is effected by the air cylinder 16, the means of the rotation is not limited thereto but may be other appropriate means, such as

a motor.

Further, in the embodiment as illustrated, while the transfer of the articles by the transfer conveyor is done by the structure using the two endless belt members, the means of the transfer is not limited thereto but may be such a transfer conveyor as having an arbitrary structure if it can appropriately convey the articles where the articles to be separated are arrayed on the conveyor.